

SCIENCE.

EDITORIAL COMMITTEE: S. NEWCOMB, Mathematics; R. S. WOODWARD, Mechanics; E. C. PICKERING, Astronomy; T. C. MENDENHALL, Physics; R. H. THURSTON, Engineering; IRA REMSEN, Chemistry; JOSEPH LE CONTE, Geology; W. M. DAVIS, Physiography; O. C. MARSH, Paleontology; W. K. BROOKS, Invertebrate Zoölogy; C. HART MERRIAM, Vertebrate Zoölogy; N. L. BRITTON, Botany; HENRY F. OSBORN, General Biology; H. P. BOWDITCH, Physiology; J. S. BILLINGS, Hygiene; J. McKEEN CATTELL, Psychology; DANIEL G. BRINTON, J. W. POWELL, Anthropology.

FRIDAY, MAY 3, 1895.

CONTENTS:

<i>National Academy of Sciences. Report of the Watson Trustees on the Award of the Watson Medal to Seth C. Chandler: S. NEWCOMB, B. A. GOULD, A. HALL.</i>	477
<i>Summary of Conclusions of a Report by Drs. D. H. Bergey, S. Weir Mitchell and J. S. Billings upon 'The Composition of Expired Air and its Effects upon Animal Life'</i>	481
<i>American Metrological Society: J. K. R.</i>	484
<i>The International Mathematical Congress: GEORGE BRUCE HALSTED</i>	486
<i>Current Notes on Physiography (V.): W. M. DAVIS</i>	487
<i>Current Notes on Anthropology (VII.): D. G. BRINTON</i>	488
<i>James D. Dana</i>	489
<i>Correspondence:—</i>	490
<i>The Distribution of Sledges, etc.: OTIS T. MASON.</i>	
<i>Scientific Literature:—</i>	490
<i>Geikie's Life of Ramsay: JOSEPH LE CONTE.</i>	
<i>McMurrich's Invertebrate Morphology: A. S. PACKARD.</i>	
<i>Vertebrate Zoölogy: C. H. M. SPALDING's Botany: W. P. WILSON.</i>	
<i>Notes and News:—</i>	497
<i>Fossil Vertebrates of Argentina; Variation in Crabs; Regression and Organic Stability; General.</i>	
<i>Societies and Academies:—</i>	501
<i>American Geographic Society; The Biological Society of Washington; The Academy of Science of St. Louis.</i>	
<i>Scientific Journals:—</i>	503
<i>The Botanical Gazette; The American Naturalist.</i>	
<i>New Books</i>	504

NATIONAL ACADEMY OF SCIENCES.

REPORT OF THE WATSON TRUSTEES ON THE AWARD OF THE WATSON MEDAL TO SETH C. CHANDLER.

ON the recommendation of the Board of Trustees of the Watson Fund, the Academy last year unanimously awarded the Watson medal to Seth C. Chandler, of Cambridge, Mass., for his investigations relative to variable stars, his discovery of the period of variation of terrestrial latitudes, and his researches on the laws of that variation. It is the pleasant duty of the Trustees to set forth the grounds on which this award was recommended.

It is a result of the well-known laws of dynamics relating to the rotation of a rigid body, as the earth is assumed to be, upon its axis, that the poles of the earth may be determined in two ways. Our globe, being a spheroid flattened at the poles and protuberant at the equator, has a certain axis passing between the points of greatest flattening. This axis has no direct connection with the rotation of the earth; it would exist if the latter, retaining its present form, did not rotate at all. It is called the axis of figure, being determined altogether by the shape of the earth.

But the earth has also an axis around which it rotates. Now, assuming the earth to be a rigid solid, there is no necessity that the axis of rotation should correspond to that of the axis of figure just described.

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison on Hudson, N. Y.
Subscriptions and advertisements should be sent to SCIENCE, 41 N. Queen St., Lancaster, Pa., or 41 East 49th St., New York.

We could take a solid body, pass an axis through it in any direction, and make it rotate on that axis.

It was shown by Euler, more than a century ago, that if a solid body rotated on an axis different from that of figure, the position of the axis of rotation in the body would be subject to a slow change, consisting in a constant revolution around the axis of figure. Were this body the earth, the latitude of a place, as determined by astronomical observation, would change in the same way. The time of one revolution of the pole would depend upon the figure of the earth. The flattening of the earth is such that, were it a perfectly rigid body, the time of revolution would be about 305 days; that is to say, the north pole would make its circuit in a period of 305 days.

There being no necessity that the two poles should coincide, the question was naturally raised whether, perhaps, there might actually be such a difference of the two poles, and, in consequence, a change of latitude of every place on the earth's surface having a period of 305 days. The first to investigate this question with all the refinements of modern astronomy was C. A. F. Peters, who, half a century ago, was an assistant at the Pulkowa Observatory. In his classic paper on the parallax of the fixed stars, one section is devoted to the question of the variability of the latitude in a period of 304 days, which, according to the then accepted value of the flattening of the earth, would be the time of one revolution of the poles. He found a coefficient of $0''.079$, with a probable error of $0''.017$. This result was so extremely minute that it might have arisen from unavoidable sources of error; and the conclusion therefore reached was that if there was any such separation of the two poles, it was too small to be certainly detected by the most refined observations.

In 1862 our late fellow member, Professor Hubbard, of the Naval Observatory,

commenced a series of observations with the prime-vertical transit of that institution, which would be available for the same research. They were interrupted after a little more than a year, by his untimely death, but were continued four years longer by his successors. The result was the same as that reached by Peters; no change having a period of 305 days could be detected.

In 1873 the question was investigated by Nyrén in connection with a longer series of observations on the latitude of the Pulkowa Observatory. His results were somewhat discordant, and the only conclusion that could be drawn from them was that the variation could not be certainly detected by these most refined observations.

Ten years later Nyrén repeated the determination, in connection with his observations for the determination of the constant of aberration. These observations, made with the prime-vertical transit, were carried through with the minutest attention, and the utmost care to avoid every conceivable source of error. Curious discordances were nevertheless found in the results for the constant of aberration.

In 1885 Küstner showed that they could be accounted for by supposing a change going on in the latitude. But nothing could be inferred respecting the law or the cause of the change.

As a result of these investigations, the coincidence of the earth's axes of rotation and of figure has, until within a very few years, been assumed by astronomers as a practically established fact; and all their methods of observation have rested upon the idea of absolute coincidence. This confidence has not been disturbed until within a few years, when the question has been reopened. But it has now apparently been settled upon a new and firmly established basis.

Dr. Chandler's work upon this subject began with observations made by him in

1884-85, using a novel form of astronomical instrument of his own invention. These observations, continued uninterruptedly for thirteen months, revealed a progressive change of a pronounced periodical character in the instrumental values of the latitude. In publishing these results in 1885 he announced his intention to continue the research throughout the remainder of that year. Yet circumstances prevented him from carrying out his intention at that time, and he did not resume his examination of the subject until six years later. Meanwhile Dr. Küstner, at the Observatory of Berlin, in 1888, published a memoir on the Constant of Aberration, as deduced by him from a series of observations also made in 1884-85, simultaneously with Chandler's series, which brought to light anomalies of an entirely analogous character. Küstner's series was not continuous enough to show the periodic nature of the phenomenon; but, by an exhaustive examination of the possible subjective sources of error, he clearly demonstrated that it was no longer permissible to retain the hypothesis of an invariable position of the pole, and he recommended that properly organized observations at various places be instituted to settle the question definitely. It was doubtless this work of Küstner's which compelled the attention of astronomers to the subject. As a result, by the coöperation of three German observatories, under the auspices of the International Geodetic Association, and the independent action of that at Pulkowa, the fact of the variability of terrestrial latitude was placed beyond question, and, by a corresponding series made at the Sandwich Islands, the further fact was established that the variable element is the position of the axis of rotation with respect to the earth's body, and not its position in space.

It was just before this point that a renewal of Chandler's connection with the

problem began. The results are published in a series of eighteen papers in the *Astronomical Journal* (1891-94), exclusive of a series of five papers upon a topic closely related thereto, and involving it; namely, the aberration-constant, which will be separately spoken of later.

The keynote of these investigations, and the undoubted cause of the success which has attended them, lies in the fact that at the outset he first recognized the necessity of deliberately disregarding all teachings of the adopted theory, which had misled previous investigators, and of examining the facts by a purely inductive process, taking nothing for granted, and basing all conclusions strictly upon the observations themselves.

It is impossible to give here more than a bare statement of the principal results thus established, which we arrange in their natural order, and not in the historical order of their derivation.

1. The phenomenon is not a local or a regional, but a terrestrial one; also it is a displacement of the earth's axial rotation with reference to the principal axis of inertia, and not of the direction of the former in space.

2. The axis of rotation, although fixed as regards its direction in space, performs a relative revolution about that of inertia in a period of 428 days. This motion is circular, with an average radius of about fourteen feet, and its direction is from west to east.

3. Simultaneously with the above motion, the actual position of the principal axis of inertia on the earth's surface is in motion about a mean position, in a period of a year. Its direction is also from west to east, but is in an ellipse, three or four times as long as broad, the major and minor axes being about twenty-five feet and eight feet respectively. The major axis is inclined at present, by about 45° to the Greenwich

meridian. The motion is central, obeying the law of proportionality of times to areas described by the radius vector about the center of the ellipse.

4. Both the radius and period in the circular 428 days' revolution are systematically variable; the former between about eight feet and eighteen feet, the latter between about 423 and 434 days; in a long period of apparently about sixty-six years. In this inequality of motion the average angular velocity is attained when the size of the circle is least or greatest when the circle has its mean dimensions.

5. Similarly there are simultaneous changes in the apparent dimensions and velocity in the annual period, which are complementary in their character to those in the 428 days' revolution; but whether they are the result of real changes in the form and dimensions of the ellipse, or the effect of an apsidal motion of long period, cannot at present be determined from the observations available. All that can be said is that observations during five years show that the line of apsides is either fixed, or, if variable, revolving only at a very slow rate.

6. Besides these two motions of relatively short period, there is distinct evidence of a third motion of rotation in a much larger term, probably not far from twelve years, with a radius of ten or fifteen feet, which reconciles similar indications of slow changes which had been pointed out by other investigators. (A. J., XII., 178; XIII., 35, 36.)

The results thus established are the outcome of the examination of an immense number of observations, covering the whole interval since the era of refined practical astronomy began, and in fact practically exhaust the materials which may be drawn for this purpose from existing astronomical annals. The endeavor to make the discussion exhaustive in this respect made it neces-

sary to completely reduce, from the original instrumental readings, extensive older series of observations. It has, incidentally, for example, rescued from almost complete oblivion the series of Pond, 1825-36, and shown that work to be of a character which will compare favorably with the most refined observations made with the meridian instruments of the present day.

Intimately connected with the work on the variation of latitude are five additional papers, containing a redetermination of the value of the aberration-constant from eight different series of observations at the Pulkowa Observatory, with the prime vertical transit and the vertical circle. The correct value of this fundamental element is one of the most important questions occupying the astronomy of the day.

VARIABLE STARS.

THE subject of variable stars was erected into a distinct branch of astronomical science by Argelander, beginning in 1843, and occupied a large share of his activity and interest during a score of years. His classical labors were succeeded or overlapped by those of Schönfeld, who assumed the principal charge of the subject for another score of years, when his devotion to the great work of the Southern Durchmusterung, and later his failing health, left opportunity for other hands to take up and continue the work where they had left it. Since the issue of Schönfeld's Second Catalogue the number of known variables has more than doubled, while the fund of observations pertaining to them has vastly increased. Chandler's work in this direction, besides the incidental work of observation and discovery which he has contributed to it, has involved the collection of all the data in astronomical history, their discussion, and the formulation of the elements of their light-variations into numerical laws. The catalogues of 1888 and 1893, while filling a

very moderate number of pages of print, are a crystallization of all the known facts. Especially may be mentioned the investigations of inequalities in the periods of these bodies. While the number of these inequalities known in Schönfeld's time amounted to only about half a dozen, Chandler has detected their existence in about eighty other stars, and has deduced the numerical laws in about fifty of them. This will indicate, in one direction only, how the labor of caring for these objects is increasing.

It would be unjust if, while alluding to these important researches, no mention were made of Mr. Chandler's ingenious and successful device of a new form of instrument for making that class of measurements of position which had previously been made by meridian instrument alone. Both the instrument and the method were novel. In the former, instead of a motion of rotation, determined mechanically by the pivots of a horizontal axis, there was substituted one about a vertical axis determined by gravitative action of an instrument resting in mercury.

As to method, instead of a vertical plane passing through the pole, which is the fundamental plane of reference for meridian instruments, there was substituted a horizontal circle. The value possessed by such an entirely different method consists in substituting a totally different sort of observation, and hence a different set of the systematic errors to which all observations are liable, so that the combined results of the two methods are likely to be freer from them than those obtained by an adherence to a single system of observation. In a memoir of 222 pages Dr. Chandler develops the theory of the instrument and method mathematically, and gives the result of its practical use in observations made with it for a year, and directed to various astronomical problems.

Although not mentioned as forming any

part of the grounds for the award of this medal, Dr. Chandler's important labors for many years upon cometary orbits are well known to astronomers. Casual mention may be especially made of his computations relative to the principal component of 1889V, and the action of Jupiter in 1886 upon it, which led to a complete transformation of its orbit; also the definite determination of the relative orbits of the several components into which the comet became separated in consequence of that disturbance.

The Trustees of the Watson Fund feel that this brilliant series of investigations is preëminently deserving of the highest recognition which can be given by the National Academy, and have therefore not hesitated in recommending the award of the medal to Dr. Chandler.

S. NEWCOMB.

B. A. GOULD.

A. HALL.

*SUMMARY OF CONCLUSIONS OF A REPORT BY
DRS. D. H. BERGEY, S. WEIR MITCHELL
AND J. S. BILLINGS UPON 'THE
COMPOSITION OF EXPIRED
AIR AND ITS EFFECTS
UPON ANIMAL LIEE.'**

1. THE results obtained in this research indicate that in air expired by healthy mice, sparrows, rabbits, guinea pigs or men there is no peculiar organic matter which is poisonous to the animals mentioned (excluding man), or which tends to produce in these animals any special form of disease. The injurious effects observed of such air appeared to be due entirely to the diminution of oxygen or the increase of carbonic acid, or to a combination of these two factors. They also make it very improbable that the minute quantity of organic

* Results of an investigation made under the provisions of the Hodgkin's Fund. Read before the National Academy of Sciences, April 16, 1895, by permission of the Secretary of the Smithsonian Institution.

matter contained in the air expired from human lungs has any deleterious influence upon men who inhale it in crowded rooms, and hence it is probably unnecessary to take this factor into account in providing for the ventilation of such rooms.

2. In ordinary quiet respiration no bacteria, epithelial scales, or particles of dead tissue are contained in the expired air. In the act of coughing or sneezing such organisms or particles may probably be thrown out.

3. The minute quantity of ammonia, or of combined nitrogen or other oxidizable matters found in the condensed moisture of human breath appears to be largely due to products of the decomposition of organic matter which is constantly going on in the mouth and pharynx. This is shown by the effects of cleansing the mouth and teeth upon the amount of such matters in the condensed moisture of the breath, and also by the differences in this respect between the air exhaled through a tracheal fistula and that expired in the usual way.

4. The air in an inhabited room, such as the hospital ward in which experiments were made, is contaminated from many sources besides the expired air of the occupants, and the most important of these contaminations are in the form of minute particles or dusts. The experiments on the air of the hospital ward, and with the moisture condensed therefrom, show that the greater part of the ammonia in the air was connected with dust particles which could be removed by a filter. They also showed that in this dust there were microorganisms, including some of the bacteria which produce inflammation and suppuration, and it is probable that these were the only really dangerous elements in this air.

5. The experiments in which animals were compelled to breathe air vitiated by the products of either their own respiration or by those of other animals, or were in-

jected with fluid condensed from expired air, gave results contrary to those reported by Hammond, by Brown-Séquard and d'Arsonval, and by Merkel; but corresponding to those reported by Dastre and Loye, Russo Gilibert and Alessi, Hofmann Wellenhof, Rauer, and other experimenters referred to in the preliminary historical sketch of this report, and make it improbable that there is any peculiar volatile poisonous matter in the air expired by healthy men and animals, other than carbonic acid. It must be borne in mind, however, that the results of such experiments upon animals as are referred to in this report may be applicable only in part to human beings. It does not necessarily follow that a man would not be injured by continuously living in an atmosphere containing 2 parts per 1,000 of carbonic acid and other products of respiration, of cutaneous excretion, and of putrefactive decomposition of organic matters, because it is found that a mouse, a guinea pig, or a rabbit seems to suffer no ill effects from living under such conditions for several days, weeks or months, but it does follow that the evidence which has heretofore been supposed to demonstrate the evil effects of bad ventilation upon human health should be carefully scrutinized.

6. The effects of reduction of oxygen and increase of carbonic acid, to a certain degree, appear to be the same in artificial mixtures of these gases as in air in which the change of proportion of these gases has been produced by respiration.

7. The effect of habit, which may enable an animal to live in an atmosphere in which by gradual change the proportion of oxygen has become so low and that of carbonic acid so high that a similar animal brought from fresh air into it dies almost instantly, has been observed before; but we are not aware that a continuance of this immunity produced by habit has been previously noted. The experiments reported in the

appendix show that such an immunity may either exist normally or be produced in certain mice, but that these cases are very exceptional, and it is very desirable that a special research should be made to determine, if possible, the conditions upon which such a continuance of immunity depends.

8. An excessively high or low temperature has a decided effect upon the production of asphyxia by diminution of oxygen and increase of carbonic acid. At high temperatures the respiratory centers are affected when evaporation from the skin and mucous surfaces is checked by the air being saturated with moisture; at low temperatures the consumption of oxygen increases, and the demand for it becomes more urgent. So far as the acute effects of excessively foul air at high temperatures are concerned, such, for example, as appeared in the Black Hole of Calcutta, it is probable that they are due to substantially the same causes in man as in animals.

9. The proportion of increase of carbonic acid and of diminution of oxygen, which has been found to exist in badly ventilated churches, schools, theatres or barracks, is not sufficiently great to satisfactorily account for the great discomfort which these conditions produce in many persons; and there is no evidence to show that such an amount of change in the normal proportion of these gases has any influence on the increase of disease and death rates which statistical evidence has shown to exist among persons living in crowded and unventilated rooms. The report of the Commissioners appointed to inquire into the regulations affecting the sanitary condition of the British Army, properly lays great stress upon the fact that in civilians at soldiers' ages in 24 large towns the death rate per 1000 was 11.9, while in the foot guards it was 29.4, and in the infantry of the line 17.9; and shows that this difference was mainly due to diseases of the lungs occurring in soldiers in

crowded and unventilated barracks. These observations have since been repeatedly confirmed by statistics derived from other armies, from prisons, and from the death rates of persons engaged in different occupations, and in all cases tubercular disease of the lungs and pneumonia are the diseases which are most prevalent among persons living and working in unventilated rooms, unless such persons are of the Jewish race.

But consumption and pneumonia are caused by specific bacteria, which, for the most part, gain access to the air passages by adhering to particles of dust which are inhaled, and it is probable that the greater liability to these diseases of persons living in crowded and unventilated rooms is, to a large extent, due to the special liability of such rooms to become infected with the germs of these diseases. It is by no means demonstrated as yet that the only deleterious effect which the air of crowded barracks or tenement house rooms, or of foul courts and narrow streets exerts upon the persons who breathe it, is due to the greater number of pathogenic microorganisms in such localities. It is possible that such impure atmospheres may affect the vitality and the bactericidal powers of the cells and fluids of the upper air passages with which they come in contact, and may thus predispose to infections the potential causes of which are almost everywhere present, and especially in the upper air passages and in the alimentary canal of even the healthiest persons; but of this we have as yet no scientific evidence. It is very desirable that researches should be made on this point.

10. The discomfort produced by crowded, ill-ventilated rooms in persons not accustomed to them is not due to the excess of carbonic acid, nor to bacteria, nor, in most cases, to dusts of any kind. The two great causes of such discomfort, though not the only ones, are excessive temperature and

unpleasant odors. Such rooms as those referred to are generally overheated; the bodies of the occupants, and, at night, the usual means of illumination, contributing to this result.

The results of this investigation, taken in connection with the results of other recent researches summarized in this report, indicate that some of the theories upon which modern systems of ventilation are based are either without foundation or doubtful, and that the problem of securing comfort and health in inhabited rooms requires the consideration of the best methods of preventing or disposing of dusts of various kinds, of properly regulating temperature and moisture, and of preventing the entrance of poisonous gases like carbonic oxide, derived from heating and lighting apparatus, rather than upon simply diluting the air to a certain standard of proportion of carbonic acid present. It would be very unwise to conclude, from the facts given in this report, that the standards of air supply for the ventilation of inhabited rooms, which standards are now generally accepted by sanitarians as the result of the work of Pettenkofer, De Chaumont and others, are much too large under any circumstances, or that the differences in health and vigor between those who spend the greater part of their lives in the open air of the country hills and those who live in the city slums do not depend in any way upon the differences between the atmospheres of the two localities except as regards the number and character of microorganisms.

The cause of the unpleasant, musty odor which is perceptible to most persons on passing from the outer air into a crowded, unventilated room is unknown. It may in part be due to volatile products of decomposition contained in the expired air of persons having decayed teeth, foul mouths, or certain disorders of the digestive apparatus,

and it is due in part to volatile fatty acids produced from the excretions of the skin and from clothing soiled with such excretions. It may produce nausea and other disagreeable sensations in specially susceptible persons, but most men soon become accustomed to it and cease to notice it, as they will do with regard to the odor of a smoking car or of a soap factory after they have been for some time in the place. The direct and indirect effects of odors of various kinds upon the comfort, and, perhaps also, upon the health of men are more considerable than would be indicated by any tests now known for determining the nature and quantity of the matters which give rise to them.

The remarks of Renk upon this point merit consideration.

Cases of fainting in crowded rooms usually occur in women, and are connected with defective respiratory action due to tight lacing or other causes.

Other causes of discomfort in rooms heated by furnaces or by steam are excessive dryness of the air and the presence of small quantities of carbonic oxide, of illuminating gas, and, possibly, of arsenic, derived from the coal used for heating.

AMERICAN METROLOGICAL SOCIETY.

THIS Society held its annual meeting at Columbia College, on April 22d, at 3 P. M.

The President, B. A. Gould, of Cambridge, Mass., presided. There were present, Wolcott Gibbs, of Newport, R. I.; A. A. Michelson, of the University of Chicago; T. Egleston and J. H. Van Amringe, of Columbia College; T. R. Pynchon, of Trinity College; T. C. Mendenhall, of Worcester, Mass.; George Eastbourn, of Philadelphia; J. M. McKinlay and J. K. Rees, of New York City.

President Gould made an informal ad-

dress, and called attention to the rapid progress of the zone standard-time system throughout the world. This system the society did important work in introducing. Allusion was made to the report that Turkey had made the Metric System obligatory. The principal countries that do not use the Metric System are England, the United States and Russia. Through the action of the New Decimal Association of England, and of the American Metrological Society, it was hoped that some steps might be taken in the two countries named which would bring about a larger use of the Metric System. It was stated that Utah proposed to adopt the Metric System as the standard when she was admitted to statehood.

The society appointed an important committee on Metric Gauges. This committee consists of the President, B. A. Gould, Wolcott Gibbs, T. C. Mendenhall, A. A. Michelson, and T. Egleston as chairman.

Reports were made by various officers and the following officers were elected for the year 1895-96: President, B. A. Gould, Cambridge, Mass. Vice Presidents, Wolcott Gibbs, Newport, R. I.; T. R. Pynchon, Hartford, Conn.; Sanford Fleming, Ottawa, Canada; T. C. Mendenhall, Worcester, Mass.; T. Egleston, New York City; J. H. Van Amringe, New York City. Treasurer, John K. Rees, New York City. Recording Secretary, John K. Rees, New York City. Corresponding Secretary, O. H. Tittmann, Washington, D. C. Members of the Council, H. A. Newton, New Haven, Conn.; Cleveland Abbe, Washington, D. C.; R. H. Thurston, Ithaca, N. Y.; A. M. Mayer, Hoboken, N. J.; Henry Holt, New York City; W. F. Allen, New York City; Simon Newcomb, Washington, D. C.; S. P. Langley, Washington, D. C.; F. H. Smith, University of Virginia; George Eastbourn, Philadelphia, Penn.

Edward Atkinson, of Boston, was elected a member of the society.

In this connection it may be of interest to state the objects of this society:

1. To improve existing systems of weights, measures and moneys, and to bring them into relations of simple commensurability with each other.

2. To secure universal adoption of common units of measure for quantities in physical observation or investigation, for which ordinary systems of metrology do not provide; such as divisions of barometer, thermometer, and densimeter; amount of work done by machines; amount of mechanical energy, active or potential, of bodies, as dependent on their motion or position; quantities of heat present in bodies of given temperatures, or generated by combustion or otherwise; quantity and intensity of electro-dynamic currents; aggregate and efficient power of prime movers; accelerative force of gravity; pressure of steam and atmosphere; and other matters analogous to these.

3. To secure uniform usage as to standard *points of reference*, or physical conditions to which observations must be reduced for purposes of comparison, especially temperature and pressure to which are referred specific gravities of bodies, and the zero of longitude on the earth.

4. To secure the use of the decimal system for denominations of weight, measure, and money derived from unit-bases, not necessarily excluding for practical purposes binary or other convenient divisions, but maintained along with such other methods, on account of facilities for calculation, reductions, and comparison of values, afforded by a system conforming to our numerical notation.

MODES OF OPERATION.

1. THE society will endeavor to carry out its objects, by appeals to Congress, State Legislatures, boards of education, higher institutions of learning, and to directors and

teachers of schools of every grade throughout the country, urging adoption of measures in their several spheres for diffusing information as to the present state of the world's metrology and recent progress in its reform, and specially for instructing the rising generation in these matters, to the end that our people may be early and fully prepared to act intelligently on the important questions connected with weights and measures.

2. By invoking the aid and coöperation of bodies organized to consider questions of scientific or social interest, boards of trade, chambers of commerce, societies of engineers, industrial associations, professions and trades, in this country and elsewhere.

3. By specially urging scientific bodies to open communications with similar bodies in other countries, with a view to general agreement on values to be henceforth uniformly given to units of measure and points of reference which particularly concern them. *i. e.*, to the so-called constants of science.

4. By memorializing Congress in favor of laws requiring the use, in certain departments of the public service, of metric weights and measures, wherever such legislation may tend to relieve commerce of some of its burdens, to facilitate international communication, to promote international jurisprudence, and to familiarize our own people with the benefits of that system of metrology, with the least interference with their ordinary habits of thought or daily business.

5. By direct appeals to the people through the public press, and by circulating, so far as means allow, books and documents informing the public of the defects of the common system of weights and measures, the means most proper for its amendment, and the great advantages which the acceptance of a universal system would insure to all mankind.

J. K. R.

THE INTERNATIONAL MATHEMATICAL CONGRESS.

PROFESSOR A. VASILIEV, President of the Physico-mathematical Society of Kasan, Russia, has sent me a document prepared by him for the Minister of Public Instruction, with a request that I translate such part of it from the Russian as bears on the founding of an International Mathematical Congress, and make it known in America.

This is in substance as follows:

After recapitulating the action of the French Association for the Advancement of Science at Caen (August 14, 1894) [already translated by me and published on pp. 21-22 of the Bulletin of the American Mathematical Society, October, 1894], he gives the resolution offered by me that very same day, August 14, 1894, for their signatures to all the members of the American Mathematical Society present at the Brooklyn meeting, and signed unanimously, which was as follows: "The undersigned members of the American Mathematical Society present at its summer meeting, 1894, take this method of expressing their cordial approval of a series of International Congresses of Mathematicians to take place from time to time, as suggested by A. Vasiliev and C. A. Laisant." The names of the signers may be found on page 290 of Vol. I., of the American Mathematical Monthly. I explained the plan as contemplating a *réunion préparatoire* at Kasan in 1896, a *congrès constituant* in Belgium or Switzerland in 1897, which perhaps might fix the First International Congress at Paris in 1900.

Professor Vasiliev then goes on to state the decisive step taken by the *deutsche Mathematiker-Vereinigung* in a reunion at Vienna, September, 1894. It was there unanimously resolved to take part in the organizing Congress. The action was as follows:

"Concerning future International Congresses, the Mathematiker-Vereinigung decides in principle to participate, and charges

its bureau to take in regard to this subject the measures that appear necessary. In particular, it leaves to each of its members entire freedom, considering alone as essential that the Society, on this important occasion, may be assured of having the place due it."

Professor Vasiliev expects that the inauguration of the Lobachèvsky monument at Kasan will take place in August or September, 1896, and counts on having there a large number of eminent mathematicians, and will profit by the occasion to propose definitely the organization of the International Congress, and then official calls will be issued to meet for the purpose of final organization in 1897 at a city of Belgium or Switzerland.

GEORGE BRUCE HALSTED.

AUSTIN, TEXAS.

CURRENT NOTES ON PHYSIOGRAPHY (V.).
THE EXTINCT LAKE PASSAIC.

THE annual report of the Geological Survey of New Jersey for 1893 contains a long report on surface geology, in which there is an interesting chapter on Lake Passaic, an extinct glacial lake, by R. D. Salisbury and H. B. Kümmel. First mentioned by Professor Cook in his annual report for 1880, Lake Passaic is now carefully traced by its shore lines and the deltas built in it by streams. Its basin was limited on the west by the slope of the crystalline highlands; on the south and east by one of the curved trap ridges of the Watchung or Orange mountains; while on the north it was enclosed by ice. Most remarkable of all the shore deposits in the lake waters is the great morainic embankment that was built across the basin from Morristown to Madison during the furthest advance of the ice sheet into the lake waters; the lobate front of this bank standing up with great distinctness north of a marshy plain, which now represents part of the lake bottom.

The outlet of the lake was, for a time at least, by a notch in the trap ridge near its southern end, at a height of 331 feet above sea level. Twenty-five miles to the north, the records of the lake level now stand sixty-seven feet above the lowest shore line at the southern end of the basin. Many details of interest are considered in the report; none more surprising than the depth of the drift-filling in the notch of one of the trap ridges at Summit (where the Morris and Essex Railroad crosses the ridge), from which a preglacial discharge of the inner valley at this point is fairly inferred. An excellent map accompanies the report.

LOCAL DISPLACEMENT OF THE MISSISSIPPI.

THE annual report of the Iowa geological survey for 1893, just issued, contains a chapter by C. H. Gordon on a former channel of the Mississippi, now filled with drift. The modern river has cut a narrow rock-bound gorge, five miles to the east of the former valley, and about ten miles long; its lower end being at Keokuk, where the Des Moines river comes in from the west. A general study of the surface and the records of a deep well indicate that the earlier valley was about three times as broad and twice as deep as the new gorge. The gorge being hardly more than in its youth, the earlier valley was certainly not advanced beyond its early adolescence. It therefore clearly indicates that during only a comparatively short preglacial time did the region stand as high as or a little higher than now; most of its preglacial history must have been passed at a less elevation above baselevel. To speak of the preglacial channel as a 'measure of vast denudation' (p. 250) therefore seems somewhat inappropriate; it was only the beginning of a denudation that could in a geographical sense be called vast. The vast denudation is more really shown in the stripping of an unknown thickness of strata

from the region, thus preparing the general surface in which the adolescent preglacial valley was eroded.

The relation of displacements of this kind to the location of settlements along the river and to the choice of places for bridge-building across it, would furnish material for an interesting physiographical essay, extending the well-known report by Gen. Warren. The outline map on which the old and new courses of the river are represented, is unfortunately without names, making the careful reading of the chapter a difficult matter for those unacquainted with such places as Fort Madison and Sand Prairie.

W. M. DAVIS.

HARVARD UNIVERSITY.

CURRENT NOTES ON ANTHROPOLOGY (VII).
RUNIC INSCRIPTIONS IN EASTERN AMERICA.

It is well known that venturous Norwegian navigators in the eleventh century visited at divers times the eastern coast of North America. The ancient sagas of Iceland which narrate the events of these voyages are provokingly meager and obscure; so that it has been quite impossible to decide how often such voyages were made, or how far south the explorers advanced. Of course, it is to be supposed that of some such expeditions we have no account whatever.

The late Professor E. N. Horsford persistently maintained that positive evidence of a pre-Columbian European settlement on the Charles river, Mass., had been discovered by him. The testimony he presented did not convince many, and his daughter, Miss Cornelia Horsford, has done well to pursue and extend the lines of investigation which her father began. The results are said to be confirmatory of his theory, but the only one which has as yet been made public is a neatly illustrated, privately printed pamphlet, of 22 pages, entitled 'An Inscribed

Stone,' By Cornelia Horsford (Cambridge, 1895).

The stone referred to was discovered at Weston, Mass., in an uncultivated field, and came under Miss Horsford's notice merely by accident. One of its sides bore a partly obliterated series of lines which Mr. J. B. Woodsworth, of the U. S. Geological Survey, pronounces to be of artificial origin. They are arranged after the manner of a runic futhorc, and simulate certain forms of such writing. Miss Horsford does not offer an interpretation.

A second inscribed stone near New York city is depicted, the runes on which Miss Horsford both transliterates and provisionally translates as referring to a census of the inhabitants by the church officials.

On a loose sheet a large number of runic and ogham inscriptions from Great Britain, the north of Europe and Greenland are given for the purpose of comparison.

The publication is one well worthy the attention of historians.

WHERE WAS THE GARDEN OF EDEN?

WE have not yet done with seeking on the earthly plane the pristine Paradise, Eden, 'the land of joy'.

The latest explorer of its whereabouts is the distinguished Professor Paul Haupt, of the Johns Hopkins University, in an article, 'Wo Lag das Paradies?' in the 'Ueber Land und Meer,' No. 15, 1895. He differs from Friedrich Delitsch, who, in his work with the same title, asserted that the description of the locality in Genesis applied directly to the canal and river system of Babylonia; he differs from himself in his opinion as expressed in a paper published last year in the proceedings of the American Oriental Society, and concludes that the four rivers mentioned in the Hebrew record, the Pison, the Gihon, the Hiddekel and the Euphrates, are, reversing the order, the Euphrates, the Tigris, the Karun and the

Kercha. The two latter are small streams flowing, one into the Persian Gulf, and one into the Schott el Arab, near the ancient mouth of the Tigris, both east of it.

Though Professor Haupt supports his opinion with his customary depth of erudition, I doubt if it will be adopted. That part of Genesis was written by the Hebrew author about 650 B. C., and at that period he certainly knew what he was talking about when he mentioned the Gihon and identified it with the river Nile. Professor Haupt's former theory, which recognized this, seems much more plausible.

But all such theories do not touch the kernel of the question. The myth of the Paradise, watered by its four streams, is found in native American mythologies as prominently as in those of the Old World; and no explanation is valid which does not apply to both continents.

The true interpretation is that the four streams refer to the four cardinal points and the four winds, the rain bringers. They are the cosmic and celestial causes of the weather and its changes, and hence of fertility and growth. It were easy to prove this by abundant examples. The Hebrew realist merely endeavored to transport the ancient myth into terrestrial geography.

D. G. BRINTON.

UNIVERSITY OF PENNSYLVANIA.

JAMES D. DANA.

WE cannot pay a tribute to the memory of Dana more appropriate than the letter addressed to him by a number of his older colleagues on his eightieth birthday and communicated by Prof. George P. Fisher to the *Evening Post*.

NEW HAVEN, February 12, 1893.

DEAR PROF. DANA: Having had the privilege for many years, of being associated with you as colleagues at Yale, we wish to bring you our cordial congratulations on the occasion of your eightieth birthday.

It gives great pleasure to your friends that after so extended a period of incessant and most faithful activity you are still able with unimpaired mental vigor to carry forward the studies which have contributed so much to the advancement of science and have conferred so great distinction, not on yourself alone, but equally on the University and on the country.

We recall the circumstance that it was only four years after your graduation, in 1833, that the first edition of your work on mineralogy, a work which has remained a classic to this day, was issued. Two years later you embarked on the voyage of discovery, undertaken under the auspices of the government by the American Exploring Expedition, and during four industrious years collected the materials for the subsequent reports on geology, mineralogy, corals and crustacea, which established your reputation at home and abroad as a scientific man of distinguished ability.

It is now well-nigh half a century since you entered upon your labors as an editor of the *American Journal of Science*, your name having first appeared on the title-page of the journal in 1846. The long series of volumes of this periodical are a noble monument of the extent and thoroughness of your labors as a naturalist.

It is in truth surprising that in connection with this continuous employment and with your work as professor you have been able to send forth from the press, in successive editions, the elaborate text-books and other writings, the solid excellence of which is everywhere recognized.

We cannot revert without admiration to the universally broad field of scientific investigation in which you have maintained your place as an acknowledged master.

It would be a signal achievement for any man to hold this position as regards geology, and the branches of zoölogy connected with it; but when, as in your case, the sci-

ence of mineralogy is added to the list, the eminence which you have attained is quite exceptional.

It is gratifying to know that your services to the cause of science have obtained full recognition from teachers and students of science and from learned bodies in all civilized countries. None will question that the honors which have thus been so abundantly bestowed and so modestly received are well deserved. The consciousness that the motive of your researches has been an unalloyed love of truth and an unselfish desire to enlarge the bounds of human knowledge must give to these testimonials all the value that such marks of honor can ever possess. We congratulate you that your academic relations both with fellow-professors and with pupils have been so uniformly pleasant. The classes which, in long succession, have listened to your instructions, could their voices be heard, would unite in expressions of sincere respect both for the qualities of character and for the talents and learning of their revered instructor. But it is no part of our purpose to enter into a detailed statement of the reasons which render it peculiarly agreeable for us, your old friends and neighbors, to offer to you to-day our heartfelt congratulations. Had it been thought worth while to extend the list of subscribers to this letter, no doubt all the members of the teaching body in the University would gladly have added their names.

But our communication is simply intended as an expression, from a few of your older associates, of interest in this anniversary and of our earnest hope that the blessing of a kind Providence may continue to be with you and with the members of your family.

Very sincerely yours,

TIMOTHY DWIGHT, GEORGE E. DAY,
GEORGE P. FISHER, GEORGE J. BRUSH,
WILLIAM H. BREWER, O. C. MARSH, FRANK-

LIN B. DEXTER, EDWARD E. SALISBURY,
WILLIAM D. WHITNEY, HUBERT A. NEW-
TON, SAMUEL W. JOHNSON, DANIEL C.
EATON, A. E. VERRILL, ADDISON VAN
NAME, SIDNEY I. SMITH.

CORRESPONDENCE.

THE DISTRIBUTION OF SLEDGES, ETC.

DID anybody ever read or hear of sledges, snowshoes or goggles for the eyes in aboriginal South America? I have traced the skee entirely across Asia, the netted snow shoe from the Amur around to Klamath river, Cal., with extension throughout Canada, New England and our northern tier of States. The ice creeper for the foot covers the region of my migration track from southern Kamchatka around to the Yukon. The built-up sledge is everywhere in the Hyperborean area of two hemispheres, the form depending on the exigencies of timber growth. The great broad skee or snow shoe of the Amur is the flat toboggan of the Dominion of Canada.

OTIS T. MASON.

U. S. NATIONAL MUSEUM, April 20.

SCIENTIFIC LITERATURE.

Memoir of Sir Andrew Crombie Ramsay. By SIR ARCHIBALD GEIKIE, Director of the Geol. Surv. of Great Britain and Ireland. London and New York, Macmillan & Co. 1895. Pp. x + 397.

This is really a charming book and ought to be read not only by every geologist, but by every one interested in the story of a noble life. Indeed, the memoir of such a man as Ramsay by such a writer as Geikie could hardly be otherwise than deeply interesting.

Ramsay's career overlaps on the one hand with the old heroic days of the founders of English Geology—Lyell, Buckland, Sedgwick, Murchison, De la Beche, etc., and on the other with modern times and modern methods. He shared with the former the

enthusiasm of grappling with the great general problems of geology; but he himself did much to introduce and urge forward the more accurate methods, if less daring theories, of modern times. The story of his forty year's connection with the British Survey, first as assistant and then as local director for England under De la Beche, then as local director of England and Scotland under Murchison, and finally as Director General himself, is literally a history of the Survey itself. The book is illuminated too and its value enhanced by the pictures of all the principal men of the Survey, whose work every geologist knows, but whose faces are now perhaps seen for the first time.

The story of Ramsay's career is also in no small degree the history of the development of geological science in England. For in the beginning he sat at the feet of the geological Gamaliels, imbibing their spirit, and at the end he gathered about himself all the most ardent and progressive spirits and guided their course. Many modern ideas he himself initiated, while others he carried forward with his characteristic ardor.

In this connection it is interesting to note, in the history of science, the transfer of study from the *remote* to the *near at hand*, from the *abstract* to the *concrete* and often from the *obscure* to the *obvious*. Thus the field of study was Astronomy before Geology, the Science of the Stars before the Science of the Earth. So also it was dead things before living things, and man last of all. This is doubtless mainly due to the fact that the nearest things and things most closely connected with our highest interests are also the most complex and most difficult to reduce to law. But this is not all. There is a fascination in the remote, the hidden and the obscure which piques our curiosity, while we neglect phenomena which lie on the surface and which therefore seem common and

trivial because we see them every day. The history of geology is an excellent illustration of this. The early geologists loved to speculate on the interior of the earth and its mysterious forces. Next rock strata, their positions, successions, foldings, faults, etc., engaged attention. In the meantime the surface configuration of the earth, mountains and plains, ridges and valleys, soils and underlying rock surfaces, in fact all the most obvious and obtrusive features were neglected. Now, the change from the study of interior structure alone to the study of surface configurations in relation to interior structures, one of the most fascinating branches of geology, took place during Ramsay's times, and he himself was one of the most active agents in bringing it about. From the first he was deeply interested in the agency of exterior forces as contrasted with interior forces; with destructive as contrasted with constructive agencies. Still later he became interested in the significance of soils and underlying rock surfaces. He it was, therefore, who first gave strong impulse to glacial geology in England. For the seed sown by Agassiz found, at first, but poor soil in England.

Again, it is instructive to note also the effect of physical environment on the course of geological science. The incessant beating of waves on the limited shore line of the 'tight little sea-girt island' of Great Britain, and the ravages produced by these attacks on some parts, early impressed the minds of British geologists with a strong sense of the *power of the sea*. In the study of erosion, therefore, all the early geologists, Ramsay among the number, attributed far too much to marine denudation, while rain and rivers were almost neglected as being of little importance in comparison. It was apparently for the same reason that the iceberg theory of glaciation took so firm a hold and was so hard to displace in England. It was only by travel on the conti-

ment of Europe, and especially in the Alps, that Ramsay was led to appreciate the great importance of rain and rivers, as compared with the sea, as a land-destroying and land-sculpturing agent; and of land ice as compared with floating ice as a glaciating agent. But his ardent, candid nature knew no half-measures. His conversion was complete, and some think that he even carried his later views on this subject somewhat too far.

The *work* of Ramsay is well known to geologists. But the readers of SCIENCE are not all geologists. It may be well therefore to briefly mention some of the main points on which he contributed to geological knowledge or modified the course of geological thought.

His greatest direct contribution to geological knowledge is undoubtedly that embodied in his admirable map of Wales. The problem of Wales had been attacked successively by Sedgwick, Murchison and De la Beche. But the work of the older geologists was far too cursory. Nothing but the most careful foot-by-foot mapping could unravel its intricate structure. This was first done by Ramsay, and he devoted a large portion of life to its completion. His map is a monument of industry combined with rare geological insight.

Again, he was undoubtedly one of the founders of the study of geographical forms in relation to geological structure. Surely this is one of the most fascinating departments of geology (or of geography, for it may be claimed by both). It is this which constitutes the chief charm of his admirable work on the 'Physical Geology and Geography of Great Britain.'

Again, he was the originator of the idea of other possible glacial periods in the history of the earth and especially of glaciation in Permian times. His ardent uniformitarianism naturally led him in this direction.

Again, finally, he was the originator of

the doctrine of the origin of lake basins by glacial erosion. It is possible that in the enthusiasm of the originator, he may have carried this idea a little too far; but it is a misrepresentation to say, as has been done, that he attributed *all* lake basins to this cause. His original paper was entitled 'Origin of *Certain* Lakes by Glacial Erosion.'

So much for Ramsay the geologist. But the greatest charm of the book is found in the vivid picture it gives of Ramsay the man; his intense interest in life in all its phases and in literature in all its departments; his large human sympathy, embracing alike all true men from the rudest country people in their sport and dances to the most eminent scientists in their discussions; his deep love of art, poetry and music; his ardor of temperament, showing itself alike in the intensity of his work and in his keen enjoyment of fun and frolic. I never saw Ramsay but once, viz., at the Montreal meeting of the A. A. A. S. in 1857, when he was in his prime. I remember well on the occasion of a geological excursion in the vicinity the rapid, eager way in which he scrambled over the rocks, hammer in hand, firing all of us with his own enthusiasm. Is it any wonder that he wore himself out prematurely? Although he lived to 77, yet he resigned and quit work ten years earlier, and was already an old man at 63.

In closing this brief account of Ramsay, I cannot do better than quote the closing words of the memoir itself, "But above and beyond the impress of his scientific achievements, Sir. Andrew Ramsay's high position among his contemporaries was largely determined by his individual personality. His frank, manly bearing, his well-cut features beaming with intelligence and a sweet childlike candor, his ready powers of conversation, his wide range of knowledge, his boyish exuberance of spirits, his simplicity and modesty of nature, his sterling integrity,

perfect straightforwardness and high sense of duty, his generous sympathy and untiring helpfulness, marked him out as a man of singular charm and endeared him to a wide circle of friends who, while they admired him for his genius, loved him for the beauty and brightness of his character."

But I cannot close this notice without a final word concerning the memoir itself as a work of art. What we wish to know of great men is not only their achievements, but also all, even the trivial details of their daily life; for these, more than aught else, show character. All things, great and small, must be brought together into a living whole. This Geikie has done in a masterly way. Journals of petty daily occurrences, narratives of more continuous work, discussion of important scientific problems, letters on all kinds of subjects to all sorts of people, some full of weighty scientific matters, some full of fun and jokes and humorous verse, some full of deepest filial or conjugal affection—all these are skillfully woven into a vivid picture of the man as he really lived. Happy is the man who shall have such a biographer.

JOSEPH LE CONTE.

A Text-Book of Invertebrate Morphology. By J. PLAYFAIR McMURRICK, M. A., Ph. D. New York, Henry Holt & Co. 1894.

In preparing this book the author has followed the zoölogical method, and has given us a succinct though general account of the morphology of the different 'types,' classes and orders of the animal kingdom; no special forms under each being described.

Speaking of the word 'type,' we much prefer the older terms, branch, sub-kingdom or phylum, to the rather meaningless word 'type;' the first and last terms being naturally suggested from the evolutionary point of view, the main sub-divisions of the animal genealogical tree being more

naturally referred to as branches or phyla. The increase in the number of 'types' from eight to twelve results from dividing the Vermes into several, such as the Platyhelminths, Nemathelminthes and Annelida, which the author regards as of the same rank as the Mollusca. The Arthropoda also, somewhat prematurely, we think, are divided into three types, viz.: Crustacea, Arachnida and Tracheata. That the division is somewhat artificial is indicated by the fact that *Limulus* is assigned to the Crustacea, though placed in an appendix, whereas it is plainly neither a genuine Crustacean nor a true Arachnid, and belongs to an independent phylum. And then if we begin thus to manufacture 'types' out of the Arthropoda and out of the Vermes, we can scarcely end at the point the author reaches.

In agreement with some German authors, the Echinodermata, written Echinoderma, are interpolated between the highly specialized Tracheata and the Protochordata. This seems to us in a text-book of this sort a shade objectionable, when we consider how closely allied to the lower worms, both in embryology and in some points in their adult structure, Echinoderms are. Of course this is a matter of individual opinion, but we should look for some expression of the reasons why they are placed so far away from worms, in a situation between such closely circumscribed and specialized groups as insects, and the Chordata. If the position assigned the Echinoderms is due solely to the resemblance of the *Tornaria* larvæ of *Balanoglossa* to the larvæ of Echinoderms, this seems a rather slight reason.

While the descriptions of the types and classes are evidently clear and accurate; though not always presented in simple Saxon words, the salient points of resemblance or difference do not seem in all cases successfully brought out. Thus in writing

of the Brachiopoda the author speaks of the bivalved shell, 'similar to that of a bivalve mollusk,' but he does not add that the shells are dorsal and ventral, a point in which they differ from any mollusk. On p. 271 it is stated that eyes do not occur in these animals, meaning, of course, the adults, though on the next page the young *Argiope* is credited with eye-spots; the fact, however, that they occur in the larva of *Thecidium* not being mentioned. In the bibliography the papers of Morse on the development of *Terebratulina* and of Kowalevsky on *Argiope*, *Thecidium*, etc., are omitted, although the lower half of the page is left blank, and there was abundant room for the titles.

The treatment of the mollusca is in some respects unsatisfactory, though the anatomical details appear to be correctly and carefully stated. We should decidedly differ from the view that Lamellibranchs, or Pelycypoda, as it is now the fashion to call them, though the name is not nearly so apt or generally applicable as the older term, are intermediate between the Gastropoda and Cephalopoda. They have no head, and it seems much more natural to suppose that they have more or less directly descended from the Amphineura. The position assigned them by Gegenbaur, next above the last named group and below the Cephalophora, seems to us to be a more natural one. And speaking of the last named group, it is a pity that there should not be more figures of these obscure generalized forms, especially of the ladder-like nervous system of the different genera to show their relationship to Chiton, though the discussion of their affinities is excellent. In speaking of the Gastropods the use of the clumsy German term 'visceral hump' seems objectionable; we should prefer to call it the visceral mass. The visceral 'hump' in a Cephalopod is in reality all of the body behind the head.

The definitions or diagnoses of the subdivisions of the 'types' placed at the end of each chapter are too brief or defective and not always, it seems to us, happily worded. In those of the Gastropoda and Cephalopoda, the fact that they have a well differentiated head is not mentioned, though the 'visceral hump,' if the student clearly understands what that is, is said to be well developed.

The same lack of completeness applies to the diagnoses of the Crustacea, and particularly to those of the insects, while those of the Arachnida are much better.

The Tracheata (myriopods and insects), as in some other recent works, are not treated with such detail and thoroughness, nor in the case of the present book, so carefully and accurately as the Crustacea. It appears to be wholly a compilation, and not the result of autoptic study. This is not the case in Siebold's excellent *Anatomy of the Invertebrates*, which, though published forty years ago, is still for Tracheata useful and reliable. Our author's account of the anatomy of insects is somewhat faulty and needs revision in numerous places.

The spiral band of the trachea is said to extend along the tube, whereas it is not continuous, but varies much in length and makes from one to four or five turns, a single tracheal branch thus having many such disconnected spiral bands.

The olfactory organs of the antennæ are not setæ alone, but the pits to which the author does not refer are far more numerous. The elements of the ovipositor are not situated on the 'last abdominal segment' (p. 414), while the cerci (p. 489) are not regarded by the author as equivalents of the jointed appendages, though they are obviously so, whatever may be said of the parts of the ovipositor. It is also a question whether the 'spring' of *Collembola* is not the homologue of the legs.

It is rather venturesome to say that in

butterflies and Diptera the thoracic segments seem to be reduced to two, etc., when three segments are easily observed. Vestigial mandibles are attributed to the sphinx, though the structures so called have been shown by Walter not to be such.

The chapter on the Protochordata is well prepared and illustrated. Why, however, *Rhabdopleura* and *Cephalodiscus* are, without apparent hesitation, regarded as belonging in this type, should, we think, be carefully explained, the chordate features being so slight compared with those of the Enteropneusta. One also is somewhat startled to find *Amphioxus* included in a work on invertebrate morphology when its structure and embryology associate it so intimately with the Chordata; and why it should be regarded as a lower or more generalized type than the Tunicata we do not understand. It has been the nearly universal opinion of anatomists that the lancelet is nearer to vertebrates than are the ascidians.

The figures are mostly diagrammatic, and carefully drawn, though often coarsely so. We should have preferred, in many cases, exact and not schematic representations. The figures of *Buccinum undatum*, as regards the shell, reminds us more of a *Strombus*; and the figure of *Nautilus* should have been credited to Owen; several of the figures are credited to Leunis, and not to the original author or artist. The style cannot always be said to be simple and clear; the tendency being towards the use of long words requiring close attention in the beginner. The typography is fair and there is a praiseworthy absence of typographical errors. But whatever we have said by way of criticism, we desire to commend the book as excellent in its general plan and treatment, usually reliable, and forming a useful manual of the subject.

A. S. PACKARD.

BROWN UNIVERSITY.

The Land-Birds and Game-Birds of New England. By H. D. MINOT. 2d edition, edited by William Brewster. Houghton, Mifflin & Co., April, 1895, 8°, pp. xxiv + 492, outline figures. Price, \$3.50.

Eighteen years have passed since the first appearance of Minot's 'Land-Birds and Game-Birds' (published in February, 1877). It had a good sale and was soon out of print. Practically the whole book was original—the descriptions of the birds, nests and eggs, and the biographies. The latter are based on the author's own field experience and are interesting, truthful, and in the main well written.

The body of the work is followed by an appendix comprising a bird calendar for eastern Massachusetts, and keys to the Land Birds of New England and the eggs of Massachusetts birds. These keys are based primarily on color and are not likely to prove of much value.

The personality of the author deserves a word. When only a boy of seventeen he had amassed a large quantity of field notes and had written the book now under review. As the editor of the new edition says in his preface: "The author had a clear head, a true heart, and a well-defined purpose, combined with an amount of literary taste and ability very rare in one so young. He was deeply in earnest, full of warm yet reverential love of nature, wholly unconscious of or indifferent to certain conventional methods of investigation and expression, yet in the main careful in observation, temperate of statement, and singularly logical and dispassionate in argument." In his thirtieth year he was chosen President of the Eastern Railroad in Minnesota, and soon after lost his life in an accident on another road.

The new edition is accompanied by a portrait of the author and is an attractive, well-printed volume. The editor, William Brewster, tells us that his 'editorial touches have been of the lightest.' He has substi-

tuted current nomenclature for the old, and has added numerous foot-notes, always over his own initials, amplifying or correcting statements made in the body of the work, which has been allowed to stand essentially as in the original edition. Mr. Brewster has also added an appendix comprising additions to Minot's list and containing an abstract of the results of his study of the gyrfalcons—a most perplexing group. He agrees with Ridgway in the number and nomenclature of the forms, and records the authentic New England specimens of each.

It is a great compliment to the worth of Minot's book that one of the most eminent of American ornithologists, and one who could ill spare the time from his own important work, was willing to edit it.

C. H. M.

The Central Nervous System of Desmognathus fusca. By PIERRE A. FISH. Reprinted from *Journal of Morphology*, x, 1, 1895.

Mr. Fish has made an important contribution to our knowledge of the brain of salamanders. His preliminary remarks embrace two statements of interest: (1) That the adult *Desmognathus fusca* lives equally well in the open air or wholly under water, even where no trace of lungs exists; and (2) that the mouth cavity and esophagus are lined with ciliated columnar epithelium. During arial respiration the floor of the mouth is alternately raised and lowered very rapidly, while when the animal was kept under water it was raised and held in that position a long time; the inference being that the blood is oxygenated by means of the epithelium of the mouth.

The simplicity of the amphibian brain renders it, as the author states, "a most admirable object for the study of morphological relations; its general absence of flexure, its successive segmental arrangement and the degree of exposure and differentiation of these segments, give it a great ad-

vantage over most other generalized forms." It was found to be remarkable for the large number of 'embryological' features preserved.

About 40 pages are devoted to the brain and cranial nerves, and the paper is accompanied by a bibliography and four plates.
C. H. M.

Introduction to Botany. By VOLNEY M. SPALDING, Professor of Botany in the University of Michigan. Boston, D. C. Heath & Co. 1895. Pp. 287.

PROFESSOR SPALDING has added to his valuable book that which was needed to make it complete, namely, a full glossary, an index, a brief chapter on the organs of flowerless plants, and a chapter on fungi. These added chapters are in keeping with the general plan of the book. The material required is briefly indicated and directions given for its care. Laboratory directions, brief notes directing the student's attention to prominent features, follow. These are extremely good, and it is hoped this feature of Spalding's method of studying plants, corresponding, as it does, with Dodge's method in biology, will be pursued by future makers of text-books, and that we have seen the last of full accounts of what is to be seen, requiring on the part of the student very little thought, and only the attention necessary for the verification of the statements. It is remarkable, when one stops to think of it, how little the inductive method is used in the study of biology. After the directions, comes a little review or summary, giving information not likely to be attained from laboratory practice. This is a very marked feature of the volume and is especially valuable because the information given is so up to date. A very slight examination of the foot-notes will reveal the fact that the very latest research work has been consulted in the preparation of this text-book.

Since the book is only a year old, and since its title is rather misleading, it may not be out of place here to give a short account of it. Its strong point is that along with the study of the morphology of the seed, the root, the stem, the leaf, the flower, the fruit, there is an excellent course of physiological work indicated. Indeed, the whole subject is discussed on the life side, and, although in spite of its title, it is a book adapted to the needs of rather advanced students, yet such a student could easily adapt it to work even in primary schools, according to the most modern pedagogical ideas.

After the general discussion of the life history of the plant, follows a similar work with each of the natural group of flowering plants, the Algæ, Fungi, Mosses, Ferns, Equiseta, and the Club mosses, conducted on the same general plan. Then follow the Pines, the Monocotyledons and the Dicotyledons, a special point being made of the relationship of the orders to each other. In this, as in the physiology, a thorough knowledge of the latest thought on the subject is shown, and more than this, the knowledge is given to the student often in a much more logical and understandable way than by consulting the original sources.

Altogether it is the best of the modern text-books on the subject, both in matter and method, and is admirably adapted for use in colleges, either as a basis for advanced work or to give the undergraduate a good general knowledge of the subject.

W. P. WILSON.

UNIVERSITY OF PENNSYLVANIA.

NOTES AND NEWS.

FOSSIL VERTEBRATES OF ARGENTINA.

WE have recently received Part II. of the *Paleontología Argentina*, forming a continuation of the *Anales del Museo de la Plata*, published under the direction of Francisco P. Moreno, Director of the Museum. This

sumptuous Memoir in royal quarto size consists of 'Contributions to a Knowledge of the Fossil Vertebrates of Argentina,' by R. Lydekker, in three parts covering the Dinosaurs and Cetacea of Patagonia and the Ungulates of the Argentine. The text is in English and Spanish in parallel columns, and is accompanied by thirty-two large plates which give us some conception of the superb collection of fossils in this Museum. In the first section the author describes the Dinosaurs from Patagonia belonging to Marsh's division of Sauropoda, which have not hitherto been described from South America. The agreement of some of these animals with the North American Dinosaurs seems to be strikingly close, so far as can be judged from Mr. Lydekker's description. The remains, however, are not well preserved. There are several plates principally illustrating the family Titanosauridæ. The Cetacea come from a marine deposit in the Territory of Chubet, and embrace especially three skulls which are far more complete than any of their European congeners and represent the Physodontidæ, Squalodontidæ, Argyroceratidæ and Platanistidæ. The most important section of the Memoir, however, is that relating to the extinct ungulates which are described from the superb collection in the La Plata Museum, belonging to the aberrant Toxodontia and Litopterna, besides the typical Artiodactyla and Perissodactyla. The author gives a clear and concise description of the principal characters of each family and of each genus, and has shown considerable skill and great clearness in matters of priority, for the confusion in South American palæontological literature and reduplication of terms is second only to that which prevails in our own country, and has arisen from the simultaneous and independent publications of Ameghino, Moreno and Mercerat. The author has not gone into the labyrinthine problems of specific priority, but has en-

deavored to clear up the genera with what appears to be considerable success. Palæontologists everywhere are placed under a great debt both to the author for his most timely review of these forms and to the Argentine Government for the liberal style in which these Memoirs have been published.

VARIATION IN CRABS.

THE English monthly, *Natural Science*, under its recent change of publishers, has not lost any of the vigor which has characterized it since its establishment three years ago, and continues to be one of the most interesting of the reviews of progress in biology and geology which come before us. The general editorial attitude is that of entire independence of all traditional theories and authorities. There is shown no bias in the present evolution controversy, either towards the Darwinian or the Lamarckian side, but an impartial consideration of each. In the April number are some comments upon the recent discussion in the Royal Society of the facts brought out by Professor W. T. Weldon's extensive statistical investigation of variations in the shore crabs, from which we take the following: "Although Professor Weldon did not say so, it must have occurred to many listeners that this first result of statistical inquiry upon variation was in direct contradiction to those who asserted that variation is not a matter of 'chance,' but has its course in determined directions. . . . His results have already established the importance of these methods, and we cannot doubt that wherever the methods are applied with discrimination equally important results will be obtained. . . . Pending such inquiry, he may be taken to have shown that there is a relation between selection and minute variation, not that selection operates upon minute variations."

It seems to us too early even to make such guarded inductions as these from these re-

searches, for their significance is very largely diminished, if not completely destroyed by our absence of a knowledge of the conditions under which these seven thousand crabs developed. If the variations were due to congenital tendencies then their selection has a bearing upon the evolution problem, but if the variations were due to varying conditions of development, as is more than probable in a large percentage of cases, their selection has no bearing whatever upon the evolution problem. This is the uncertainty which vitiates this method, and is strangely overlooked by the editors of *Natural Science* as well as by others. None the less, this investigation is a step in the right direction towards a sound inductive basis for the solution of this most pressing biological problem of the day.

REGRESSION AND ORGANIC STABILITY.

MR. FRANCIS GALTON (42 Rutland Gate, London W.) would be glad to receive information regarding :

(1) Instances of such strongly marked peculiarities, whether in form, in color or in habit, as have occasionally appeared in a single or in a few individuals among a brood; but no record is wanted of monstrosities, or of such other characteristics as are clearly inconsistent with health and vigor.

(2) Instances in which any one of the above peculiarities has appeared in the broods of different parents. In replying to this question, it will be hardly worth while to record the sudden appearance of either albinism or melanism, as both are well known to be of frequent occurrence.

• (3) Instances in which any of these peculiarly characterised individuals have transmitted their peculiarities, hereditarily, to one or more generations. Especial mention should be made whether the peculiarity was in any case transmitted in all its original intensity, and numerical data would be particularly acceptable, that showed the fre-

quency of its transmission (*a*) in an undiluted form, (*b*) in one that was more or less diluted, and (*c*) of its non-transmission in any perceptible degree.

GENERAL.

At a meeting of the secretaries of the Scientific Societies of Washington on April 18th, Hon. Gardiner G. Hubbard, President of the Joint Committee, presiding, it was decided to print in *SCIENCE* regular reports of the meetings of all the societies.

PHILADELPHIA has been selected as the place for the next meeting of the Society of American Naturalists. In conjunction with it will meet the affiliated societies—the American Morphological Society and the American Physiological Society, and probably the Geological Society of America, the Association of American Anatomists and the American Psychological Association.

PROFESSOR WOLCOTT GIBBS, President of the National Academy of Sciences, Professor Herman Knapp of Columbia College and Professor Hugo Münsterberg of Harvard University have been appointed an American committee to collect money for the memorial to Helmholtz to be erected in Berlin.

DR. LOUIS-FLORENTIN-CAMEIL died at Fontenay-sous-Bois on March 11th, at the great age of ninety-seven. He was for many years head physician of the Asylum for the Insane of Charenton, being the successor of Royer Collard and Esquirol.

MR. J. C. SUMNER, of the Royal College of Science, has been appointed Curator of the Port Erin Biological Station.

DR. JOHN FISKE gave, during April, at the Berkeley Lyceum, New York, a course of lectures on 'Lessons of Evolution in Relation to Man.'

THE 'Mazamas,' a society of mountain climbers organized in Oregon last year, propose sending by heliograph a message and

reply from British Columbia to Mexico on July 10th. The coöperation of societies and individuals is requested in order that all the intervening mountain peaks may be occupied. Communications should be addressed to Mr. T. Brook White, Secretary, Portland, Oregon.

A NATIONAL ETHNOLOGICAL EXPOSITION will be held at Prague from May 16th to October 12th.

AMONG the papers read at the annual spring meeting of the Institution of Naval Architects on April 3d, 4th and 5th, at London, were 'Notes on Further Experience with First-class Battleships,' by Sir William White; 'On Solid Stream Forms,' by D. W. Taylor, U. S. Navy, and 'On the Method of Initial Condensation and Heat Waste in Steam Engine Cylinders,' by Professor R. H. Thurston.

MR. CHRISTOPHER HEATH, of University College, has been elected President of the Royal College of Surgeons, to fill the vacancy caused by the death of Mr. J. W. Hulke.

MR. HERBERT SPENCER has begun a new series of articles in *The Popular Science Monthly* for May. His general subject is 'Professional Institutions,' one of the divisions of his Synthetic Philosophy, and he will aim to show how each of the professions has been developed out of the functions of the priest or medicine-man.

THE New York Legislature has appropriated \$16,000 for scientific work in horticulture. The work will be under the immediate charge of Professor L. H. Bailey of Cornell University.

THE Legislature of California has appropriated \$250,000 to erect a building in San Francisco for the professional departments of the University of California.

THE international importance of the work done at the Columbia College Observatory in investigating the subject of variation of

latitude has been recently indicated by an offer, from the Royal Geodetic Institute at Potsdam, of a considerable sum of money to be used in employing computers to reduce the results.

A SOCIETY has been incorporated in the State of New York for the preservation of scenic and historic places and objects. Mr. Andrew H. Greene, to whom the movement is chiefly due, is president of the society, which includes among its trustees a number of the leading citizens of New York.

THE University of Kansas will send into the field the present season five different scientific expeditions. Professor Dyche leaves the first of May to collect and study the birds and mammals of Greenland and adjacent regions; Professor Williston will have two expeditions for the collection of vertebrate fossils, one in Western Kansas and one in Wyoming; Chancellor Snow, it is expected will spend the summer in the Southwest with a party collecting entomological specimens; a fifth party under Professor Haworth will be in the field during the next six months engaged in mapping the Tertiary outcrops of the State. The cost of the three geological expeditions is borne by special appropriations from the State Legislature.

MR. MARK W. HARRINGTON, Chief of the Weather Bureau, has issued a circular stating that a periodical is proposed, devoted to Climatology and its relation to health and disease, similar in size and general appearance to the monthly weather review. The coöperation is requested of sanitary boards and societies, and of individuals interested in this work.

THE Italian Botanical Society met this year at Palermo on the 13th and 26th of April. The German Zoölogical Society will meet at Strasburg on the 4th to the 6th of June.

ACCORDING to the *Zeitschrift für Luftschiffahrt* and the *Revue Scientifique*, Herr Berson, on December 4, made the highest balloon ascent on record, attaining an altitude of 9,100 metres. The temperature at this altitude was -47.8° C. The highest temperature, 6.1° C., was at a height of 1,400 metres.

THE death is announced of Dr. Peck, director of the Museum of Natural History in Gorlitz.

AMONG recent new appointments in Germany we note that Dr. Himstedt, professor of physics in Giessen, has been called to Freiburg; Dr. Czermak, professor of ophthalmology in Innsbruck, to Prague, and Dr. Steinmann, professor of mineralogy in Freiburg, to Tübingen. Dr. Minkowski has been made professor of mathematics in Königsberg.

THE mathematician, Dr. E. D. F. Meissel, died at Kiel, on March 11, at the age of sixty-eight years.

The *Revue Scientifique* of April 13th reports the speeches made at the banquet given in honor of M. Berthelot on April 4th. Speeches were made by MM. Poincaré, Brisson, Perrier, Richet, Zola and M. Berthelot himself.

PROFESSOR RYDER at the time of his death had nearly completed the MS. of a book, and left other scientific work of importance which will probably be published shortly under very competent editorship.

THE Prince of Wales has formally presented to Sir Joseph Lister the Albert Medal of the Society of Arts for "the discovery and establishment of the antiseptic method of treating wounds and injuries, by which not only has the art of surgery been greatly promoted and human life saved in all parts of the world, but extensive industries have also been created for the supply of materials required for carrying the treatment into effect."

The American Naturalist for March contains illustrations of some remarkable forms of deep sea fishes dredged by the U. S. Steamer Albatross at depths varying from 700 to 1500 fathoms and recently described by Dr. G. Brown Goode and Mr. Tarleton H. Bean in the Proceedings of the U. S. National Museum. The genera have been named *Hariotta*, *Rondletia* and *Cetomimus*.

M. L'ABBÉ MAZE has communicated to the Paris Academy an account of the earliest meteorological observations made in France. They were carried out by the astronomer Boulliau from the 25th of May, 1658, to 19th of September, 1660. The winter was unusually cold, whereas April was warmer than in any recent year, excepting April, 1865. M. Maze also shows that Boulliau used a mercury thermometer 62 years before Fahrenheit's invention.

SOCIETIES AND ACADEMIES.

NATIONAL GEOGRAPHIC SOCIETY.

At the regular meeting of the National Geographic Society in the large hall of Cosmos Club, Washington, D. C., Friday evening, April 19, Mr. Robert T. Hill, of the U. S. Geological Survey, delivered an address upon the Geography and Geology of Costa Rica and Panama. The fact that he has only recently returned from a tour of scientific investigation of the region, during which he saw a good deal of the prevailing revolutionary spirit, gave special interest to his remarks.

Grateful acknowledgment was made for the opportunity to study the geology of the adjacent continental and island areas furnished the speaker by the enlightened liberality of Prof. Agassiz.

Mr. Hill's lecture, illustrated by a large number of very interesting lantern slides, mostly from photographs taken by him during his recent trip, was partly popular and partly technical in character, descriptive of the topography, vegetation, products, archi-

tecture and customs of the widely contrasting regions of the Isthmus of Panama and the modern Spanish American Republic of Costa Rica to the northward.

The Isthmus was discussed as a type of the low-lying costal lands of the tropical region, where Caucasian population could only be maintained by constant immigration, and which would be uninhabited did it not lie in the track of commerce between two oceans. All of its population, except a few unconquered Indian tribes, is concentrated in the two seaports of Colon and Panama, or along the right of way of the railway and canal. On either side it is still an unconquered jungle. The important commercial and political American interests in this region were discussed, showing that its traffic is entirely in the control of Americans, and that it is an important point between our Atlantic and Pacific sea-ports.

Costa Rica, on the other hand, is an example of the higher and better climatic conditions existing in the Tropical American region, where indigenous civilization flourishes under healthy climate conditions. Mr. Hill spoke of this as an ideal country and praised the hospitality and progressive spirit of the people. Illustrations were given of the entire course of the Panama canal, showing the topography, cuttings, machinery and laborers at present working upon the construction. While not committing himself to any preference of canal routes, he said that the affairs of the Panama Canal Company had been painted in this country much darker than they deserved. A far greater amount of work had been accomplished than is supposed. The machinery instead of rotting is kept in the best of condition and the affairs of the Company are not as hopelessly involved as represented. A liberal sum is still in the treasury, and while the concern is in the hands of the courts, it looks as if the French had no intention, after having completed

the hardest part of the canal construction, of abandoning it. The terminal port facilities have been completed. Nearly 25 miles of the canal is finished, reducing the distance between the oceans from 47 to 22 miles; about two-fifths of the necessary grading has been accomplished, and every possible machine and tool for its completion is upon the ground. The great problem of controlling and diverting the waters of the Chagres has also been accomplished. It is the general opinion of all Americans who have observed the work, including the engineering of our own famous Cabin John Bridge, that no great obstacle stands in the way of the early completion of this work except the recuperation of its financial affairs from the shameful mismanagement they have suffered.

The lecturer gave interesting accounts of the various zones of vegetation seen in ascending the great volcanoes of Costa Rica, and, incidentally, a general description and classification of the region bordering the Gulf and Caribbean Sea. Especial attention was called to the important bearing of this Spanish American region, between the latitude of the Orinoco and the southern boundary of the United States, upon the great problems of continental development, and its correlated biologic and meteorologic problems; and to the great work Prof. Alexander Agassiz has undertaken at his own expense in studying the marine physiography of the region, especially as regards the origin of its vast areas of coral reefs.

The relief of this portion of the earth's surface, a knowledge of which involves a study both of the land and the submarine topography, was provisionally classified into four great divisions: mountains of accumulation; mountains of corrugation; coastal plains of uniformly uplifted marginal sea-bottom, and land formed by the combined action of coral polyps and wind and tide (as described by Prof. Agassiz).

In speaking of the mountains he classified the systems as follows:

1. The southern extension of the Cordilleran region of the United States, which terminates with the great scarp of the Mexican plateau in the latitude of Vera Cruz.

2. The Andes proper, the north and south ridges of which end abruptly in Northern Colombia.

3. A system of more ancient mountains having an east and west trend and composed of folded Mesozoic rocks, with Paleozoic axes, extending along the north coast of South America (between the Caribbean and Orinoco); throughout the Greater Antilles; and through Guatemala, Nicaragua and British Honduras. For this Mr. Hill proposed the name of the 'Antillean System.' It was shown that there were submarine topographic ridges connecting the Honduras peninsula with the islands of Jamaica, Hayti and Puerto Rico, probably also parts of this ancient corrugation.

4. Protuberances of older volcanic accumulation, such as the Windward Islands and Isthmian region.

5. Mountains of recent volcanic accumulation, including the three widely separated groups, with different trends, of southern Mexico, Central America and the northern Andes, all more or less parasitic upon the termini of the antecedent and fundamental mountain systems of corrugation, and to a certain extent (owing to their newness and greater mass) concealing them.

EVERETT HAYDEN,
Secretary.

BIOLOGICAL SOCIETY OF WASHINGTON.

At a meeting on April 6th, Dr. Theo. Gill read a paper 'On the Torpedoes.'

The subject was discussed from two points of view, taxonomic and nomenclatural.

The family of Torpedoes, or cramp fishes, is well differentiated from all others by the development (from original muscular tis-

sues) of a pair of electric batteries in the region between the cranium and anterior extension of the pectoral fins. The family is divisible naturally into three sub-families which should be called *Narcobatinæ*, *Narcininae* and *Hypninae*. These sub-families are differentiated by modifications of the cranium and skeleton generally, disk, tail, position of spiracles and structure of teeth. The nomenclature involves a singular point. The name *Torpedo* was first applied (by Forskal in 1775) as a generic term to the electric catfish of the Nile subsequently called *Malapterurus*, and was accompanied by a tolerable generic diagnosis. (The full history and etymology of the word *Torpedo* was given.) Therefore *Torpedo* must be used for the Nematognath fish. The electric ray must consequently receive another name, and *Narcobatis*, of Blainville, is therefore available. The genera would then have the following names: *Narcobatinæ*, with *Narcobatis* and *Tetranarce*; *Narcininae*, with *Narcine*, *Discopyge*, *Narbe* (*Astrabe*) and *Temera*; *Hypninae*, with *Hypnos*.

Mr. L. O. Howard cited the name *Tarantula* as a similar case in which a generic name had long been misapplied. It was first given to a scorpion, and after long service as the name of a spider it has recently been restored to its original meaning. Dr. W. H. Dall and Dr. C. Hart Merriam both agreed that in all such cases the strict law of priority should govern.

Major J. W. Powell spoke on the Classification of the Subject-Matter of Biology and the paper was discussed at length.

FREDERIC A. LUCAS,
Secretary.

ACADEMY OF SCIENCE OF ST. LOUIS.

THE Academy held its regular meeting on April 15 with President Green in the Chair and twenty-nine members and visitors present.

Miss Mary E. Murtfeldt read a paper on

'Habits of Certain Seed Feeding Insects,' giving the result of her observations and experiments with insects which feed upon the seeds of weeds and other injurious plants. Some of these insects were new to science. Miss Murtfeldt stated as her conclusion that the seed feeding insects exercise a very pronounced effect in preventing the spread of weeds, and in many instances almost exterminate them.

A. W. DOUGLAS,
Recording Secretary.

SCIENTIFIC JOURNALS.

BOTANICAL GAZETTE, APRIL.

Issued April 20, 1895. 64 pp., 2 pl.

Present Problems in the Anatomy, Morphology and Biology of the Cactaceæ: W. F. GANONG.

This is the first installment of a paper (to be concluded in the May number) setting forth in brief statement what is at present known of this group in regard to the topics enumerated in the title, and the problems, mainly to be solved by careful field observation and a study of development, which still remain to be worked out.

Flowers and Insects, XIV.: CHARLES ROBERTSON.

In this paper and its predecessor (*Bot. Gaz.* 20: 104, Mr. 1895) Mr. Robertson has somewhat changed his plan of contributions to the relations of flowers and insects, in now bringing together his information in regard to the several species of a genus, accompanying it with a voluminous bibliography. Species of *Gentiana*, *Frasera*, *Phlox*, *Lithospermum*, *Physalis* and *Mimulus* are discussed.

Notes From My Herbarium, II.: WALTER DEANE.

The herbarium of Mr. Deane is one of the finest private collections in this country in the excellence and completeness of the plants represented, viz., those of the range of Gray's Manual. It is specially rich in

its representation of life histories of plants so far as these can be shown by dried specimens. In this series of notes Mr. Deane is putting on record some of the information gained in the making of this collection. The fruit of *Nymphæa odorata* Ait., a case of teratology in *Apocynum androsaemifolium* L., and *Typha latifolia* L. are discussed in No. II.

Synopsis of North American Amaranthaceæ, II.:
EDWIN B. ULIN and WM. L. BRAY.

This installment of the paper gives a systematic enumeration of the N. Am. species of the genera *Acnida* and *Gomphrena*. *Acnida tamariscina prostrata* and *Gomphrena Tuerckheimii* are described as new. To the latter *Telanthera Tuerckheimii* Vatke is probably to be referred.

A Reply to Dr. Robinson's Criticism of the 'List of Pteridophyta and Spermatophyta of North-eastern America:' FREDERICK V. COVILLE.

Among *Briefer Articles* Mr. J. Schneck describes and figures the flowering and fruiting of the spider-flower, *Cleome spinosa* L., a subtropical species which reaches up the Mississippi valley as far as S. Ills.; Mr. Geo. H. Shull records some observations on the branching, inflorescence and flowers of *Enslenia albida*, illustrated with a plate; Mr. F. H. Blodgett adds some points to a paper (Bot. Gaz. 19: 61. F 1894) on the development of the bulb of the adder's tongue, *Erythronium Americanum* Ker.; Mr. Thomas Meehan gives a short biographical sketch of the late John H. Redfield of Philadelphia, and Professor W. W. Bailey does the same for the late Mr. George Hunt of Providence, R. I. In a note on the Systematic Botany of North America, Professor N. L. Britton, the chairman of the Board of Editors, gives a list of the parts at present assigned to the collaborators named.

The editorials deal with the discussion on nomenclature and the progress of the Systematic Botany of North America. In the

department of Current Literature Sayre's *Materia Medica* (botanical part), Thomas and Dudley's *Manual of Histology*, and Lister's *Monograph of the Mycetozoa* are reviewed, with briefer mention of several other works. The number closes with six pages of notes and news regarding botanists, their doings and writings.

THE AMERICAN NATURALIST, APRIL.

On the Presence of Fluorine as a Test for the Fossilization of Animal Bones.

Experimental Evolution Amongst Plants: L. H. BAILEY.

Observations on a so-called Petrified Man: J. M. STEDMAN.

On the Validity of the Genus Margaritana: CHAS. T. SIMPSON.

Editor's Table; Recent Literature; Recent Books and Pamphlets; General Notes; Geography and Travels; Mineralogy; Petrography; Geology and Paleontology; Botany; Zoölogy; Entomology; Embryology; Psychology; Archeology and Ethnology; Microscopy.

Proceedings of Scientific Societies; Scientific News.

NEW BOOKS.

The Cambridge Natural History, Vol. III., Molluscs. A. H. COOKE. Brachiopods (recent), A. E. SHIPLEY. Brachiopods (fossil), F. R. C. REED. New York and London, Macmillan & Co. 1895. Pp. xi + 535. \$2.60.

Elements of Mineralogy, Chrystallography and Blowpipe Analysis. ALFRED J. MOSES and CHARLES LATHROP PARSONS. New York, D. Van Nostrand Company. 1895. Pp. vii + 342.

Steam Power and Mill Work. GEO. W. SUTCLIFFE. New York, Macmillan & Co. 1895. \$4.50.

A Treatise on Bessel Functions. ANDREW GRAY and G. B. MATTHEWS. New York, Macmillan & Co. 1895. \$4.50.